Cultivation of pepper

Pepper is a tropical plant that grows in hot humid areas with a high rainfall. Locally it can only be grown in the Lowveld and along the northern coastal areas of KwaZulu-Natal.

Botanical characteristics

- The pepper plant is an evergreen perennial. It attaches itself to trees or trellises by means of aerial roots and is not a parasitic plant.
- The leaves are oblong, pointed at the tip and arranged alternately.
- Pepper plants have a shallow root system. There are usually a few major lateral roots that can penetrate the soil to a depth of 2 m.
- The white flowers are minute and mainly hermaphroditic (both sexes in one flower). The flowers converge in oblong spikes which later form clusters.

A fruiting branch of a pepper plant

- The pepper plant has 3 types of runners:
  - The main stem (primary runner) forms the permanent stem from which other runners develop.
  - The secondary runners are round, long shoots with lengthy internodes. They climb to a considerable height and later droop downwards.
  - Tertiary runners are short, sturdier branches that spread horizontally from the axils of primary and secondary runners.

- Flowers and clusters always develop opposite a leaf and only on tertiary wood.
- The fruit is round berries, 4 to 10 mm in diameter and converge in oblong clusters. Each berry has a single spherical seed of 3 to 6 mm, encapsuled by the fruit flesh.
Climatic and soil requirements

- Pepper is a tropical plant and cannot tolerate frost. It will not grow where the temperature drops below 12 °C. A moderate winter climate is essential.
- Pepper plants need about 2 000 mm rain annually. In South Africa the rainfall must be supplemented by irrigation.
- The soil should have a good structure and water-holding capacity. Drainage must be good to prevent root rot.
- The pH should be 5.5 to 6.0.
- The red dolerite soils of KwaZulu-Natal and the red andesite soils of the Soutpansberg are best for growing pepper plants.
- A high humus content is advantageous.

Propagation

- Propagation is usually by means of cuttings.
- One or two-leaf cuttings are taken only from secondary runners during September.
- Cuttings are rooted in mistbeds and transplanted into the land after 9 months.

Spacing

Spacing between the rows is 3 m and between the plants 2 m, which gives 1 666 plants/ha.

Trellising

Because pepper is a climbing vine, provision must be made for supports. Treated poles must be used, because the expected lifetime of the plants is 20 years. No shade is needed when planting pepper, because too much shade will result in yield reduction.

Fertilisation

- Pepper plants react very well to organic fertilisation. Kraal manure can, therefore, be used at about 5 kg/plant/year. If kraal manure is applied or if the soil pH is slightly high (6.5), ammonium sulphate can be used as nitrogen source. About 600 g per mature plant per year at a rate of 100 g per application is required. Plants only respond well to nitrogen when the soil has a high level of potassium.
- Magnesium must be applied in the form of magnesium sulphate at about 750 g per plant. If the soil is too acid 500 to 1 000 g dolomitic lime can be applied every 2 years.
- A general directive for the fertilisation of pepper is:
  - 700 g LAN per year per plant, divided into 7 applications
  - 500 g superphosphate in a single application
  - 450 g potassium chloride, divided into 2 or 3 applications.

Mulching

Pepper plants have a shallow root system. The use of an organic soil cover is therefore very beneficial. It keeps the soil damp for longer periods and dramatically reduces temperature fluctuations between day and night.

Irrigation

- Overhead irrigation is preferred to flood irrigation.
The most effective irrigation system consists of permanent plastic microjets. The rainfall must be supplemented by irrigation to about 2 000 mm/year.

**Pruning and maintenance**

Pepper plants are pruned to
- get stronger plants
- reduce wild growth of the runners
- keep the plants at a certain height
- stimulate the growth of lateral fruit-bearing branches.

When the plants are not pruned, the secondary runners will show dense growth and suppress the tertiary runners, with a resultant loss in yield. Young plants are only allowed to retain 3 main runners. To strengthen these runners, they must be pruned back to 7 internodes. The long secondary runners hanging from the top must be pruned every year.

**Yield**

- After flowering, it takes about 9 months before the ripe berries can be picked.
- They ripen over a period of 2 to 3 months.
- The berries are green at first, turning yellow and then red when fully ripe. The berries are harvested every 7 to 14 days.

The first commercial yield from cuttings is harvested from the third year and the maximum yield from the seventh year. The harvesting time in South Africa is from November to January.

The table shows the harvesting calendar of all the main pepper producing countries.

### Harvesting calendar of pepper

<table>
<thead>
<tr>
<th>Type</th>
<th>Origin</th>
<th>Months Jan-Dec (1-12)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 2 3 4 5 6 7 8 9 10 11 12</td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>Brazil</td>
<td></td>
</tr>
<tr>
<td></td>
<td>India</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Indonesia</td>
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<tr>
<td></td>
<td>Madagascar</td>
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<td></td>
<td>Malaysia</td>
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</tr>
<tr>
<td>White</td>
<td>Brazil</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Indonesia</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Malaysia</td>
<td></td>
</tr>
</tbody>
</table>

**Processing**

Three types of pepper are available in the trade:
- white pepper
- black pepper
- preserved green pepper (in brine).
Preparation of white pepper

- The berries must be picked when they are ripe or red, and then fermented to remove the flesh surrounding the peppercorns. The fruit flesh ferments by means of bacterial fermentation.
- The peppercorns are then washed repeatedly, until the clean greyish-brown peppercorns remain. They are then dried in the sun for 12 hours.
- The colour must be cream to white and the moisture content 12 to 15 %. From 100 kg of ripe berries about 28 kg (28 %) dry white pepper can be produced.

Preparation of black pepper

- The clusters are harvested while still green, but mature.
- These are immersed in almost boiling water for a few minutes after which they turn dark brown to black.
- The berries are then dried in the sun for 16 to 20 hours.
- The skin of the berries shrinks, giving the peppercorn a wrinkled appearance.
- From 100 kg of green berries about 35 kg (35 %) dry black pepper can be produced.

Diseases

The main problem with the cultivation of pepper is root rot, caused by *Phytophthora*. Symptoms of root rot are wilting of the leaves and discoloration of the stem bark. *Phytophthora* is a soil fungus which flourishes in wet and poorly-drained soils. It will attack the roots, leaves, branches and the berries of the plant. Affected plants usually die off within 10 days.

Pests

Pepper is subject to root damage caused by several plant parasitic nematodes. The most important of these are the burrowing nematode (*Radopholus similis*), the root-knot nematode (*Meloidogyne* sp.), the spiral nematode (*Helicotylenchus* sp.), the ring and the dagger nematode.

Nematode control should start in the nursery and cuttings should only be rooted and transplanted into nematode-free soil.

Uses

Worldwide about 75 % of black pepper is used domestically and 25 % of white pepper. The meat-processing industry uses about 35 to 40 % of the world production. Dried seeds of pepper contain 2 % volatile oil, which is used in sausages and table sauces.

Quality

The degree of dryness may not exceed 12 to 15 % moisture. Imported pepper is subject to strict standards (see table).

Requirements for imported pepper

<table>
<thead>
<tr>
<th></th>
<th>White pepper</th>
<th>Black pepper</th>
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</thead>
<tbody>
<tr>
<td>Nonvolatile ether extract</td>
<td>6,5 %</td>
<td>6,5 %</td>
</tr>
<tr>
<td>Ash content</td>
<td>2,5 %</td>
<td>7,6 %</td>
</tr>
<tr>
<td>Foreign ingredients</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

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